

No. 727,116.

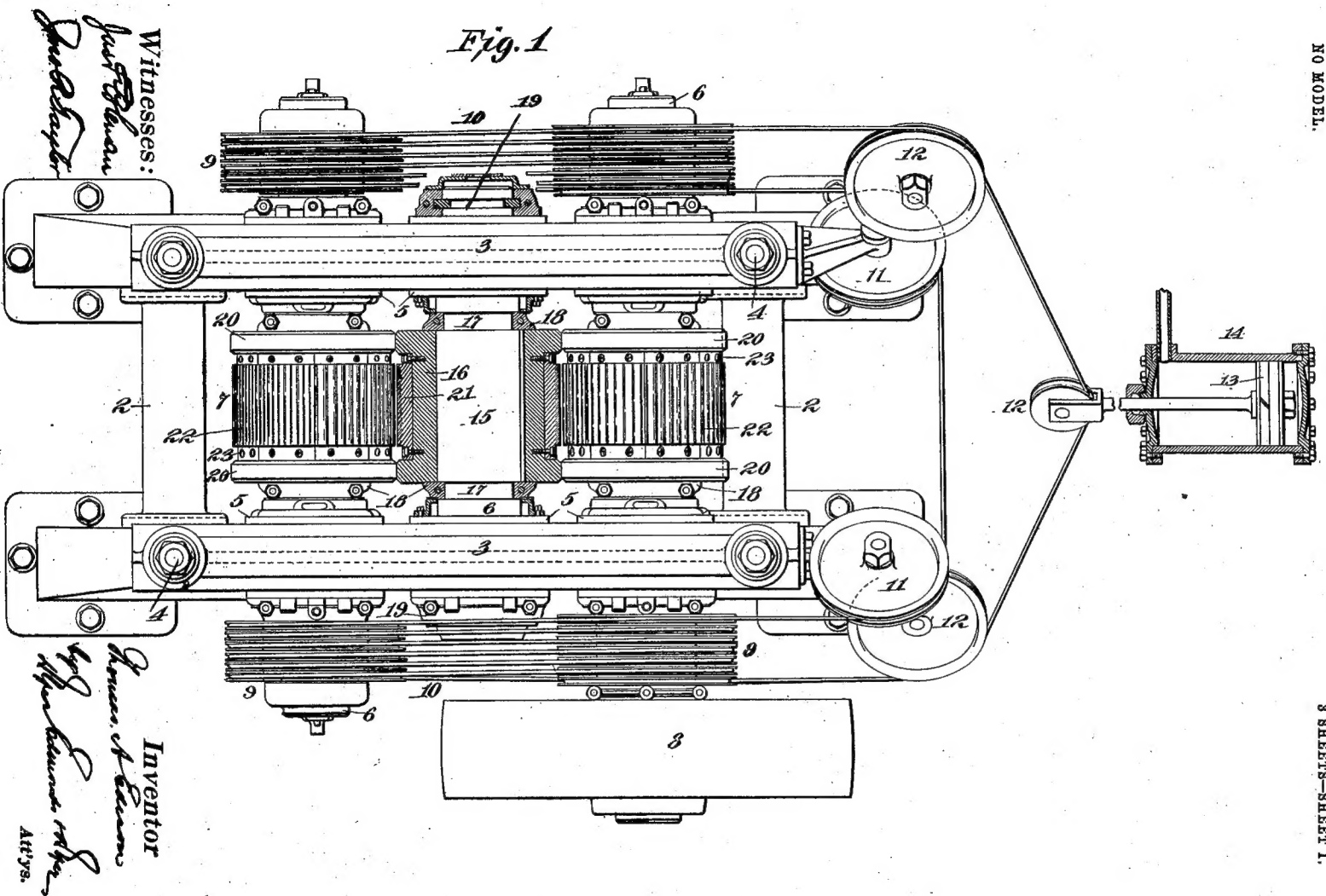
PATENTED MAY 5, 1903.

T. A. EDISON.  
GRINDING ROLLS.

APPLICATION FILED JULY 1, 1899.

NO MODEL.

3 SHEETS-SHEET 1.



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3 SHEETS—SHEET 2.

NO MODEL.

Fig. 8

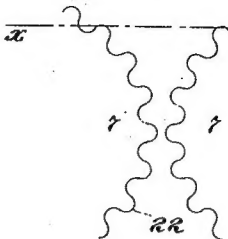


Fig. 2

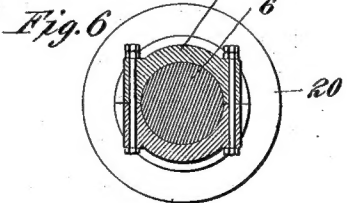
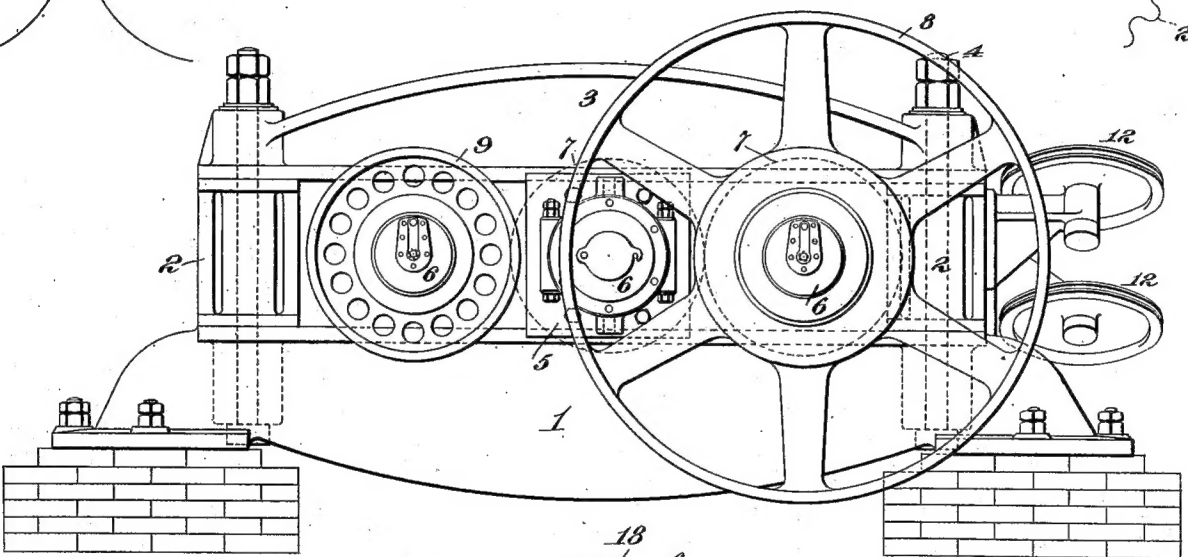
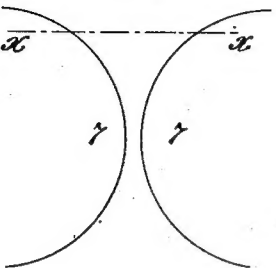


Fig. 1



Witnesses:

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3 SHEETS—SHEET 3.

Fig. 3

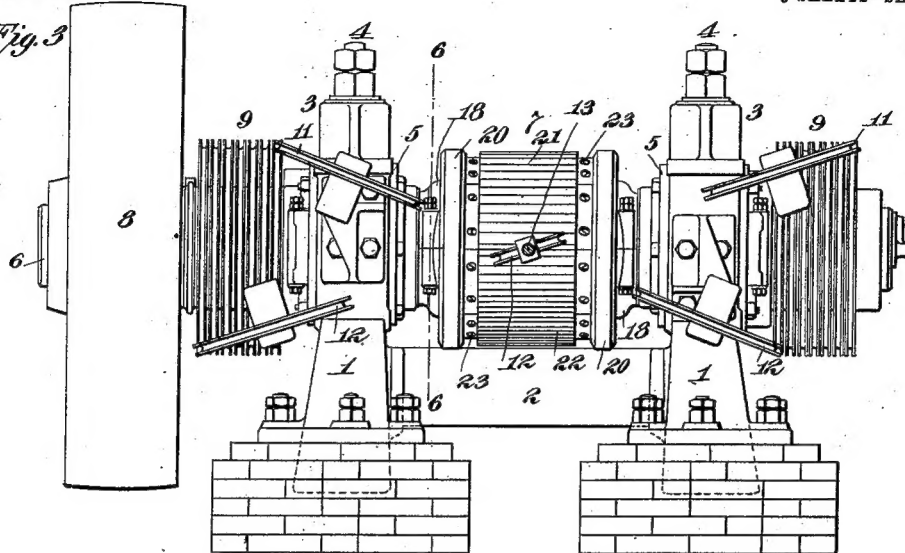


Fig. 4

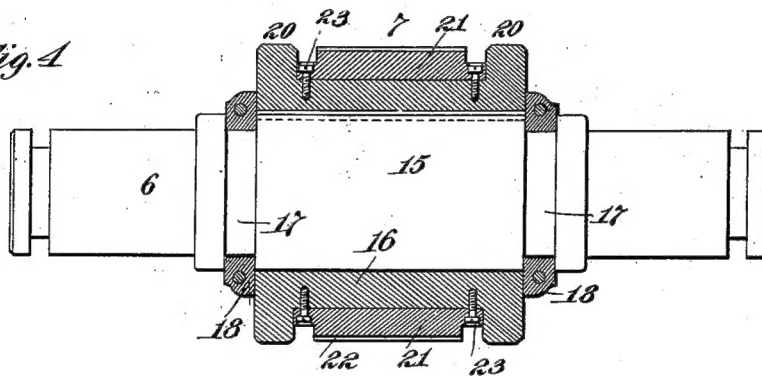
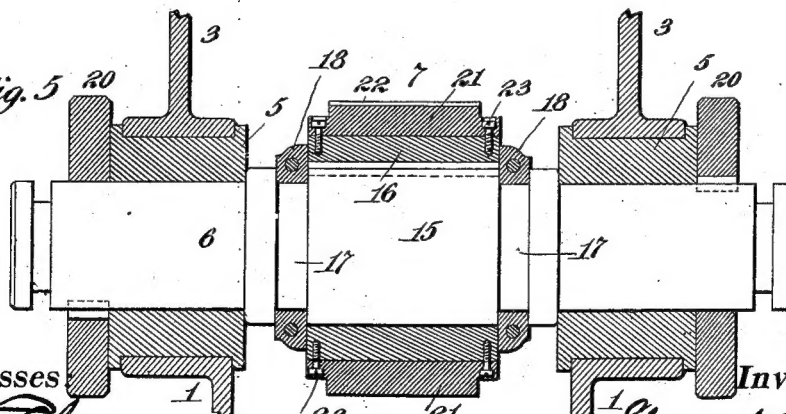


Fig. 5



Witnesses

*James Coleman*  
*John R. Taylor*

Inventor

*Thomas A. Edison*  
*by Alfred Edmunds*

Att'ys.

# UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

## GRINDING-ROLLS.

SPECIFICATION forming part of Letters Patent No. 727,116, dated May 5, 1903.

Application filed July 1, 1899. Serial No. 722,532. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Grinding-Rolls, (Case No. 1,008,) of which the following is a description.

My invention relates to various new and useful improvements in rolls intended for the fine grinding of ores, cement, or other pulverizable material.

The present improvements are specially adapted for use in connection with rolls of the general type heretofore invented by me and described and claimed in application for Letters Patent filed July 16, 1897, Serial No. 644,746, wherein three rolls are employed arranged in line and which are forced together by means of an endless wire rope passing around independently-mounted sheaves on the axes of the two outer rolls. In this way the stress tending to force the rolls together to produce the grinding is imposed upon moving surfaces, whereby friction will be reduced to a minimum. The present improvements may, however, less advantageously be applied in connection with ordinary grinding-mills, wherein the thrust of the pressure-producing devices is imposed upon non-rotatable bearing-boxes.

The object of the invention is to provide grinding-rolls which shall be capable of operation upon much greater quantities of material than is possible with any grinding-rolls heretofore suggested.

With rolls intended particularly for the grinding of dry pulverizable material it is desirable that the rolls should be of a comparatively small diameter in order that the available grinding-surface may be sufficiently reduced as to enable the proper pulverizing action to take place without the necessity of the imposition of prohibitive strains in the apparatus. When relatively smooth grinding-rolls are employed, the gap or throat angle between the two adjacent rolls is necessarily great, so that in the operation of such rolls prior to my invention there was always a tendency for the material to slip relatively to the grinding-surfaces, and in consequence the feed was comparatively slow. As a result of

this action I have heretofore found it impracticable to employ chilled surfaces on grinding-rolls, and with the smooth rolls with which I have experimented prior to the present invention I have secured the best results, so far as the quantity of feed is concerned, by the employment of rolls having relatively soft peripheries. By means of my present invention I am enabled to construct grinding-rolls with chilled peripheries, and hence of great durability, wherein the tendency of the material, however dry, to slip relatively to the grinding-surfaces is entirely overcome, and in consequence a maximum feed of the material can be secured. I secure this result by corrugating the surfaces of the grinding-rolls, whereby the rolls themselves will cause the material to be drawn positively down into the throat between the rolls and to be crushed by such rolls. The corrugated surfaces of the grinding-rolls are prevented from actually engaging together by the provision of smooth separating-rims carried with or upon such rolls. I also improve the construction and operation of grinding-rolls in certain matters of detail, which will be specifically referred to and embodied in the claims.

In order that my invention may be better understood, attention is directed to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a plan view, partly in section, of the preferred embodiment of my present invention, showing the same in use in connection with a set of three rolls of the general type described and claimed in my said application; Fig. 2, a plan of the same; Fig. 3, an end view; Fig. 4, an enlarged longitudinal section through one of the grinding-rolls and its shaft; Fig. 5, a similar view illustrating a modification; Fig. 6, a section on the line 6 6 of Fig. 3; Fig. 7, a diagram illustrating the action which takes place with grinding-rolls having smooth grinding-surfaces in the grinding of dry pulverizable material, and Fig. 8 a similar view illustrating the operation which takes place with grinding-rolls constructed in accordance with my present invention.

In all of the above views corresponding parts are represented by the same numerals of reference.

1 1 represent two heavy side girders secured to a suitable foundation; and 2 2 cross-frames connecting the side girders at their ends.

5 3 3 are top braces extended between the ends of the frames 2 2 parallel with the girders 1 1.

The parts are all held together by heavy tie-bolts 4.

10 The space at each side of the machine between the girders 1 and top braces 3 comprises a longitudinal guide for bearing-boxes 5 5, in which are mounted the shafts 6 of the three rolls 7 7 7. These bearing-boxes do not

15 receive any of the thrust of the work and are employed solely for the proper guiding of the rolls. The bearing-boxes 5 for one of the end rolls are fixed against longitudinal movement, and the shaft of that roll carries a belt-

20 wheel 8, to which power is applied. Loosely mounted on the shafts of the end rolls are the independent sheaves 9 9, around which extends an endless wire rope 10, one bight of which passes over the stationary guide-pul-

25 leys 11 and the other over the guide-pulleys 12 12, which are connected to the piston 13 of a pressure-cylinder 14, as I describe in my said application. By admitting a suitable fluid-

30 pressure to the cylinder 14 the three rolls will be forced tightly together with an increased pressure due to the number of turns given to the wire rope, and in operation the said wire rope will be permitted to move with the rolls,

35 whereby a practically frictionless bearing will be secured. The shaft 6 of each of the rolls is provided at its center with an enlarged boss 15, having a keyway therein, and keyed upon said boss is the shell 16 of the roll, said shell being preferably cast in one

40 piece. In order to prevent longitudinal movement of the shell with respect to the shaft, the boss 15 is provided with recesses 17 17, within which are placed the split collars 18,

45 which bear against the ends of the shell 16 and practically lock the latter rigidly to the shaft. Longitudinal movement of the shafts 6 with respect to their bearing-boxes 5 is prevented by means of thrust-bearings 19 of any suitable type. In the preferred embodiment

50 of my invention the shell 16 of each roll is provided at its ends with smooth rims 20 20, bearing on corresponding rims of the adjacent rolls, as shown. The space on each roll between these rims constitutes a surface upon

55 which are secured a plurality of plates 21, having corrugated surfaces 22, as shown. Preferably these corrugations extend entirely across the plates 21 from side to side. With my present invention it will be entirely possible and desirable to make the plates 21 with

60 chilled surfaces. The plates 21 are held in place in any suitable way, but preferably by means of bolts 23, which are provided with locks of any suitable type to prevent accidental loosening. The parts will be so proportioned that the engaging rims 20 of the

rolls will maintain the corrugated surfaces 22

of the grinding-plates of adjacent rolls separated to a very slight extent—say about one thirty-second of an inch—whereby the corrugated surfaces of the rolls will be kept out of 70 engagement without interfering, however, with an effective grinding operation.

Instead of forming the smooth bearing-rims 20 directly on the shells 16 of the grinding- 75 rolls said rims may be formed entirely independently of the grinding-rolls and may be keyed to the shafts 6 on the outside of the bearing-boxes 5, as shown in Fig. 5, it being only necessary for the carrying out of my 80 invention that the rolls should be suitably roughened and that smooth supporting-rims should be employed, however they may be located, for keeping the corrugated or roughened surfaces of the grinding-rolls out of en- 85 gagement.

In operation power is applied to the belt-wheel 8 for directly driving the roll connected to its shaft, and the other rolls are driven by 90 friction therefrom or by the friction between the rolls and the passing stream or streams of material. With ordinary grinding-rolls having smooth peripheries, as shown in Fig. 7, assuming the depth of material between the 95 rolls to be represented by the line  $xx$ , it will be seen that the angle of the throat or gap between the rolls is comparatively great, and in consequence there is an inevitable tendency on the part of the material to slip relatively to the grinding-surfaces, whereby the quan- 100 tity of feed is comparatively small. By providing the grinding-rolls with corrugated or roughened surfaces, as shown in Fig. 8, it will be observed that any tendency on the part of the material to slip relatively to the rolls is 105 entirely overcome, since the adjacent surfaces of the rolls constitute pockets for drawing the material positively downward between the rolls.

It will be of course understood that the 110 grinding-rolls provided with corrugated peripheries and with smooth bearing-rims for keeping the said corrugated peripheries out of engagement may be applied in connection with other devices than the specific type illus- 115 trated—for example, with the ordinary grinding-rolls the shafts of which are carried in non-rotatable bearings upon which the thrust of the crushing strains is received. It will 120 furthermore be understood that when the invention is employed in connection with three rolls of the type illustrated the material may be caused to pass successively between one of the end rolls and the central roll and back 125 again between the said central roll and the other end roll, as I describe in my said application, or instead of either of these arrangements it will be advantageous in some instances to place the rolls in a horizontal 130 plane and to pass the material only between two of them, in which case the corrugated grinding-surface of one of the end rolls may be dispensed with, the shaft of that roll being only provided with the smooth separat-

ing-rims 20 for engagement with the corresponding rims of the central roll. It will furthermore be understood that only two rolls may be employed, connected together by an  
5 endless moving cable or rope, the latter being crossed between each of the independently-mounted sheaves, as I also mention in my said application, although I do not consider such an arrangement to be so desirable  
10 as the employment of three shafts carrying either two or three rolls, with the endless rope or cable extended between independently-mounted sheaves on the ends of the outer shafts.

15 Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. The combination of two rolls having longitudinally - corrugated peripheries, and  
20 smooth separating-rims mounted concentrically to each of said rolls and engaging together to effect the separation of the corrugated peripheries thereof, substantially as set forth.

25 2. The combination of grinding-rolls having longitudinally - corrugated peripheries, smooth separating-rims mounted concentric-

ally with said rolls and engaging together to prevent the engagement of the corrugated peripheries of the rolls, and a moving cable 30 for exerting stress upon the rolls and for affording a movable bearing therefor, substantially as set forth.

3. The combination of three rolls arranged in the same plane and having longitudinally- 35 corrugated peripheries, smooth separating-rims mounted concentrically with the rolls and engaging together to prevent the engagement of said corrugated peripheries, independently-mounted sheaves on the shafts of 40 the end rolls, and an endless cable passing back and forth around said sheaves, substantially as set forth.

4. As a new article of manufacture, a grinding-roll having smooth rims and a longitudi- 45 nally-corrugated grinding-surface arranged between said rims and of a less diameter than said rims, substantially as set forth.

This specification signed and witnessed this 15th day of June, 1899.

THOMAS A. EDISON.

Witnesses:

J. F. RANDOLPH,  
J. A. BOEHME.